Response of Seed Yield and Oil Quality of Iranian Native Sesame Genotypes to Drought Stress

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ABSTRACT

Abbasali, M., Gholipouri, A., Tobeh, A., Khoshkholgh Sima, N. A. and Tajedin, B. 2019. Response of seed yield and oil quality of Iranian native sesame genotypes to drought stress. **Seed and Plant Production Journal 35-2:** 133-157 (in Persian).

Eight sesame genotypes along with Oltan and Darab1 cultivars were evaluated for seed yield and oil biochemical traits using randomized complete block design with there replications under normal and drought stress conditions in Karaj, Iran, in 2014 and 2015. Drought reduced seed yield by 45.1 %, oil content by 2.5%, palmitoleic fatty acid by 24.0%, and increased the antioxidant power of oil by 99.4%, total lignin of oil by 18.9 and seed crude protein by 15.6%. In fact, drought stress had a beneficial effect on seed oil quality. Genotype KC50662 had reasonable yield under two conditions. In addition, its seed oil content was 5.3% higher than cv. Oltan. This genotype had the lowest amount of harmful palmitic fatty acid (8.5%) second next to Oltan cultivar (8.2%). This genotype had more beneficial oleic (47.1%) and palmitoleic (0.09%) fatty acids compared to cv. Oltan (43.1% and 0.07%, respectively). This genotype also had lower level of stearic acid (4.7%), higher level of linoleic acid (42.0%), higher level of lignans (4237 mg kg^{-1}), and lower level of antioxidants power (23.5 µmol L^{-1}) compared to cv. Oltan (5.4%, 38.7%, 3541mg kg^{-1}, and 33.9 µmol L^{-1}, respectively). Tolerance and susceptibility indices could identify genotype KC 50662 as high yielding, and KC 50658, KC 50687 and KC 50983 as tolerant genotypes. In conclusion, genotype KC50662 was identified as superior genotype with high seed yield, in both normal and stress conditions, and oil quality properties.

Key words: Sesame, abiotic stress, tolerance, seed yield, saturated fatty acid.

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Determination of Sowing Time, Grain Yield Potential, Yield Gap, and Risk Analysis of Wheat Production in Rainfed Regions of Khuzestan Province in Iran

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ABSTRACT

Andarzyian, S. B. 2019. Determination of sowing time, grain yield potential, yield gap, and risk analysis of wheat production in rainfed regions of Khuzestan province in Iran. **Seed and Plant Production Journal 35-2:** 159-181 (in Persian).

Khuzestan province has large areas of rainfed wheat where the average grain yield, due to annual variability in weather conditions and poor management, is less then one ton per hectare. To zoning rainfed wheat areas in Khuzestan based on planting time, yield potential and yield gap as well as production risk the AquaCrop and CERES-Wheat models were used. Long-term daily weather data of each region, after processing, and the dominant soil texture were arranged as models inputs to simulate planting time and yield potential for each region. Risk analysis was performed for models outputs using RAINBOW software. All results moved to Geographical Information System (GIS) for zoning. The results showed that the commencement of sowing time in central (Shushtar) and northeast (Izeh) regions starts 15 days earlier than north (Dezful) and southeast (Behbehan) regions. The longest cropping season with 164 days (2190 GDD) and shortest with 124 days (1860 GDD) belonged to northeast (Izeh) and central (Shushtar) regions, respectively. The results also showed that the average grain yield potential varied from 4.2 (Izeh) to 1.7 (Shushtar) tons per hectare. Average grain yield potential of south to north, northeast and southeast had an increasing trend and it was proportional to the amount of rainfall. The results of risk analysis revealed that production risk varied in different zones, and zones with higher yield potential have lower production risk. The results indicated that yield gap varied from 88% (Izeh and Behbahan) to 66% (Shushtar and Dezful). Areas with higher yield potential had more yield gaps. Overall, suitable sowing time window of wheat in rainfed areas of Khuzestan (from 11 November to 16 December) is the same as sowing time window for irrigated wheat. To quantify the contribution of each factor affecting the yield gap and recommendation of appropriate crop management practices to reduce the gap, further researches are required for evaluating the model for simulating the effects of water, fertilizers and weeds.

Key words: Wheat, zoning, rainfed, sowing time, crop management.

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Growth Characteristics and Seed Yield of Peanut (*Arachis hypogea* L.) as Affected by Topping Height and Application Methods of Zinc and Calcium Nano Chelates

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ABSTRACT

Nobahar, A., Mostafavirad, M., Zakerin, H. R., Syfzadeh, S., and Valadabady, A. R. 2019. Growth characteristics and seed yield of peanut (*Arachis hypogea* L.) as affected by topping height and application methods of zinc and calcium nano chelates. **Seed and Plant Production Journal 35-2:** 183-201 (in Persian).

Peanut is one of the most important legume crop and rich in oil and protein. Topping of peanuts is important for penetration of solar radiant into canopy, and mineral nutrients improve peanut seed yield. This experiment was carried out as split plot arrangements in randomized complete block design with three replications in research station of Guilan agricultural and natural resources research and education center, Rasht, Iran, in 2016 and 2017 cropping seasons. Experimental treatments included: no topping topping, of main stem at 10 and 20 centimeters height above the soil surface were assigned to main plots and 10 treatments: non application of nano chelate as check, soil application of Zn, Ca and Zn+Ca, foliar application of Zn, Ca and Zn+Ca nano chelates and integrated application methods of Zn, Ca and Zn+Ca nano chelates as sub plots. The results showed that the highest seed yield (2722 $kgha^{-1}$), pod number per plant (24.47), 100-seed weight (82.19 g), biological yield (6540 $kgha^{-1}$), harvest index (57.53 %) and seed Zn content (12.08 ppm) obtained in foliar application of Zn nano chelates and topping of main stem at 20 centimeters above the soil surface. The highest seed Ca content (35.86 ppm) was measured under foliar application of Ca nano chelates and toppin of main stem at 20 centimeters above the soil surface. It was concluded that the foliar application of Zn nano chelates and topping of the main stem at 20 centimeters enhanced seed yield due to photosynthetic capacity increment and increasing of solar radiation penetration into the canopy of peanut under Guilan climatic conditions.

Key words: Peanut, topping, 100 seed weight, seed yield, harvest index.

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The Relationship Between Size and Type of Shoot with Fruit Bearing in Some Pistachio (*Pistacia vera* L.) Cultivars Under Khorasan Razavi Climatic Conditions

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ABSTRACT

Sherafati, A. and Arzani, K. 2019. The relationship between size and type of shoot with fruit bearing in some pistachio (*Pistacia vera* L.) cultivars under Khorasan Razavi climatic conditions. **Seed and Plant Production Journal 35-2:** 203-219 (in Persian).

In pistachio flower buds is formed on the lateral and terminal branches of current growth and bearing happens on one-year-old branches. To achieve higher yield, the production and selection of the best bearing shoots is important in the orchard management. The aim of this research was to explore and determine the relationship between size and type of shoot with fruit bearing in some pistachio (*Pistacia vera* L.) cultivars under Khorasan Razavi climatic conditions. This research was carried out using randomized complete block design with three replications in 2012 and 2014 in pistachio collection orchard at the pistachio research station of Feizabad, Khorasan Resavi province, Iran. Three pistachio cultivars including: Abbasali, Akbari and Badami-Sefid were evaluated. The results showed negative significant correlation between diameter of terminal shoot and the number of nuts on cluster of terminal branch ($r = -0.67^{*}$), and between the number of flower buds on lateral shoot and the weight of flower bud on lateral shoot ($r = -0.64^{*}$). There was also negative significant correlation between the percentage of blank nut and the weight of flower buds on terminal shoot ($r = -0.78^{*}$), and between the number of flower bud on terminal shoots and the weight of dry nut in terms of ounce ($r = -0.84^{**}$). On the other hand, there was positive significant correlation ($r = 0.79^{*}$) between lateral shoot length and the number of flower bud. The effect of year on the number and length of lateral shoots, diameter of terminal shoots, abscised flower buds on lateral shoots, the weight of flower buds on the terminal and lateral shoots and the weight of nuts was significant ($P < 0.01$). There was not significant correlation between diameter and length of terminal shoots and the number of flower buds, but there was positive correlation between lateral shoot length and the number of flower buds. Therefore, any orchard management prectices that prevent the excess growth of terminal shoots and also increase the growth of lateral shoots will lead to increasing pistachio yield. In conclusion, the results of this research will be useful for the orchard management and suitable pistachio trees pruning for higher yield.

Key words: Pistachio, lateral branch, shoot growth, flower bud, kernel percentage.

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Response of Rooting and Some Biochemical Traits of Cutting of Olive (*Olea europaea* L.) cv. Concervolia to Indole Butyric Acid and Puterscine

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ABSTRACT

Khaleghi, E., and Alavipour Jallieh, S. 2019. Response of rooting and some biochemical traits of cutting of olive (*Olea europaea* L.) cv. Concervolia to indole butyric acid and puterscine. **Seed and Plant Production Journal 35-2:** 221-243 (in Persian).

This experiment was conducted to investigate the effect of different concentrations of indole butric acid (IBA) (0, 2000 and 4000 ppm) and puterscine (0, 100 and 200 ppm) on some of the morphological and biochemical traits of hard- rooting cutting of olive cv. Concervolia. Experimental treatments were arranged as factorial in randomized complete block design with three replications. Analysis of variance showed that IBA × puterscine effect was significant on rooting and callusing percentage, root number, root weight, shoot number and shoot weight as well as on carbohydrates and nitrogen content, C:N ratio, peroxidase and polyphenol oxidizes. The highest peroxides (0.114 µmol min^{-1} g_{FW}^{-1}), polyphenol oxidase (0.140 µmol min^{-1} g_{FW}^{-1}) and rooting percent (100%) were obtained in cuttings treated with 4000 ppm IBA, while rooting was 80 percentage in cutting treated with 4000 ppm IBA+100 ppm puterscine. Based on the results of this research, it can be cancluded that the concentration of 4000 ppm of indole butyric acid or the combination of 4000 ppm of indole-butyric acid and 100 ppm puterscine can be used for enhancing rooting in the hard- rooting cuttings of olive cv. Concervolia.

Key word: Olive, carbohydrate, enzyme, nitrogen, protein, rooting.

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Grain Yield of Wheat and Chickpea and Some Soil Properties as Affected by Different Tillage Systems Under Dryland Farming Conditions of Lorestan Province in Iran

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ABSTRACT

Zalaghi, F., Ghanbari, S. A., Mousavi Nik, S. M., Cyrus Mehr, A. and Asoudar, M. A. 2019. Grain yield of wheat and chickpea and some soil properties as affected by different tillage systems under dryland farming conditions of Lorestan Province in Iran. **Seed and Plant Production Journal 35-2:** 245-260 (in Persian).

To investigate the effect of climate and tillage system on rainfed wheat and chickpea grain yield and some soil properties in Lorestan province, an experiment was conducted as factorial arrangements in randomized complete block design with three replications. Three tillage systems included: conventional tillage, minimum tillage, and no-tillage, in three cold climates (Nurabad), warm (Kuhdasht) and temperate (Khorramabad) in Lorestan province, Iran, in 2017-18 cropping seasons. Combined analysis of variance revealed that the effect of climate and tillage systems on wheat grain yield and soil bulk density as well as climate and tillage system interaction effect on chickpea grain yield, soil volumetric moisture content, organic carbon content, and soil temperature was significant. The results showed that the highest wheat grain yield (2512.22 kg ha^{-1}) obtained in Kuhdasht and between tillage systems in minimum tillage system (2422.78 $kgha^{-1}$). The highest grain yield of chickpea obtained in Kuhdasht under the minimum tillage system (1828.8 kg ha^{-1}). The lowest soil bulk density (1.29 g cm^{-3}) obtained in Kuhdasht under conventional tillage system. The highest soil volumetric moisture content (22.09 %), the highest soil organic carbon (2.01 %), and the lowest soil temperature (21.7 ◦C) obtained in Khorramabad under no-tillage system. The results of this research showed that the highest grain yield obtained in the minimum tillage system, and lowest in no-tillage system for both crops. There was no significant difference between conventional tillage and no-tillage system for grain yield of wheat. Kuhdasht had the lowest soil bulk density under the conventional tillage system which was not significantly different from minimum tillage in Khorramabad. Based on the results of this research, grain yield of wheat and chickpea and soil properties were reasonable under minimum tillage system in dryland farming of Lorestan province in Iran.

Key word: Conservation tillage, no-tillage, minimum tillage, crop rotation, organic carbon.

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Forage Yield and Quality and Water Productivity of Kochia, Millet, Sorghum and Maize Under Water Deficit Stress Conditions

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ABSTRACT

Najajinezhad, H., Javaheri, M. A., Koohi, N., and Shakeri, P. 2019. Forage yield and quality and water productivity of kochia, millet, srghum and and maize under water deficit stress conditions. **Seed and Plant Production Journal 35-2:** 261-283 (in Persian).

To evaluate forage yield and quality as well as water productivity of kochia (*Kochia scoparia* L. Schrad), millet (*Pennisetum glaucum* L.), sorghum (*Sorghum bicolor* L. Moench) and maize (*Zea mays* L.) under water deficit stress conditions, a field experiment was carried-out as split plot arrangements in randomized complete block design with four replications in two years (2016-2017) in Kerman, Iran. Three irrigation regimes including; optimal irrigation, mild and severe stress levels based on 80, 130 and 180 mm cumulative pan evaporation, respectively, were assigned to main plots and four plant species; kochia, millet, sorghum and maize were randomized in subplots. Sorghum had the highest forage yield in all irrigation regimes. Sorghum in optimal irrigation had 101241 kg ha^{-1} of fresh forage and 30181 kg ha^{-1} dry forage. With increasing drought stress severity, yield reduction was lower in kochia than other plant species. The highest water productivity obtained under mild drought stress. The highest water productivity in optimal, mild and severe drought stress levels belonged to sorghum with 3.17, 2.97 and 2.8 kg m^{-3}, respectively. Millet had the highest (11.8%) and sorghum the lowest (8.9%) crude protein in dry forage. Based on the results of this research, sorghum had the highest forage yield and water productivity, and kochia was the most tolerant plant for drought stress conditions. Considering the importance of quantity and quality of forage for livestocks, it is suggested that intercropping of sorghum and millet will be considered as a research priority in future.

Key word: Dry forage, crude protein, drought tolerance, mild stress, potassium.

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Preliminary Selection of Some Pear Rootstocks for Tolerance to Deficit Irrigation Stress Based on the Growth and Physiological Indices

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ABSTRACT

Zohouri, M., Abdollahi, H., Arji, I., and Abdossi, V. 2019. Preliminary selection of some pear rootstocks for tolerance to deficit irrigation stress based on the growth and physiological indices. **Seed and Plant Production Journal 35-2:** 285-301 (in Persian).

Tolerance to drought stress is important characteristic related to growth of pear trees and selection of rootstocks for orchard establishment. In this research, growth and physiological indices were evaluated in several pear rootstocks including; micropropagated Dargazi, *Pyrus betulifolia* and three clonal rootstocks; Pyrodwarf, OH×F69 and OH×F87 after 60 days in deficit irrigation conditions. Deficit irrigation levels were 75% and 50% of filed capacity and non- stress condition as control were implementend in greenhouse. *P. betulifolia* and OH×F87 rootstocks demonstrated the highest and lowest growth rate and tolerance to the deficit irrigation conditions based on relative growth rate (RGR) and leaf number ($tg\alpha_{ln}$). Monthly evaluation of leaf relative water content (RWC), proline, total carbohydrates and total proteins as well as membrane stability and electrolyte leakage showed that *P. betulifolia* with 72.1% RWC had the lowest level of this index in optimal (control) condition. However, despite the highest reduction of RWC to 57.1 and 58.3, on 30 and 60 days after deficit irrigation, respectively, in *P. betulifolia,* this rootstock could maintain the highest growth rate. Based on the results of this research the highest levels of tolerance to the deficit irrigation was observed in *P. betulifolia* followed by Pyrodwarf, OH×F69, Dargazi and finally OH×F87 rootstocks, respectively. These results showed the importance of selection of tolerant pear rootstocks and need for further orchard evaluation of them for establishment of pear orchards in stressful conditions.

Key word: Pear, drought stress, *Pyrus betulifolia* Bunge, Pyrodwarf, OH×F series, greenhouse condition.

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